

# NISTTech

## Method for Scalable Fabrication of Semiconductor Nanowire Devices

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### Industrial Scale Fabrication of Nanowire-Based Devices

#### Description

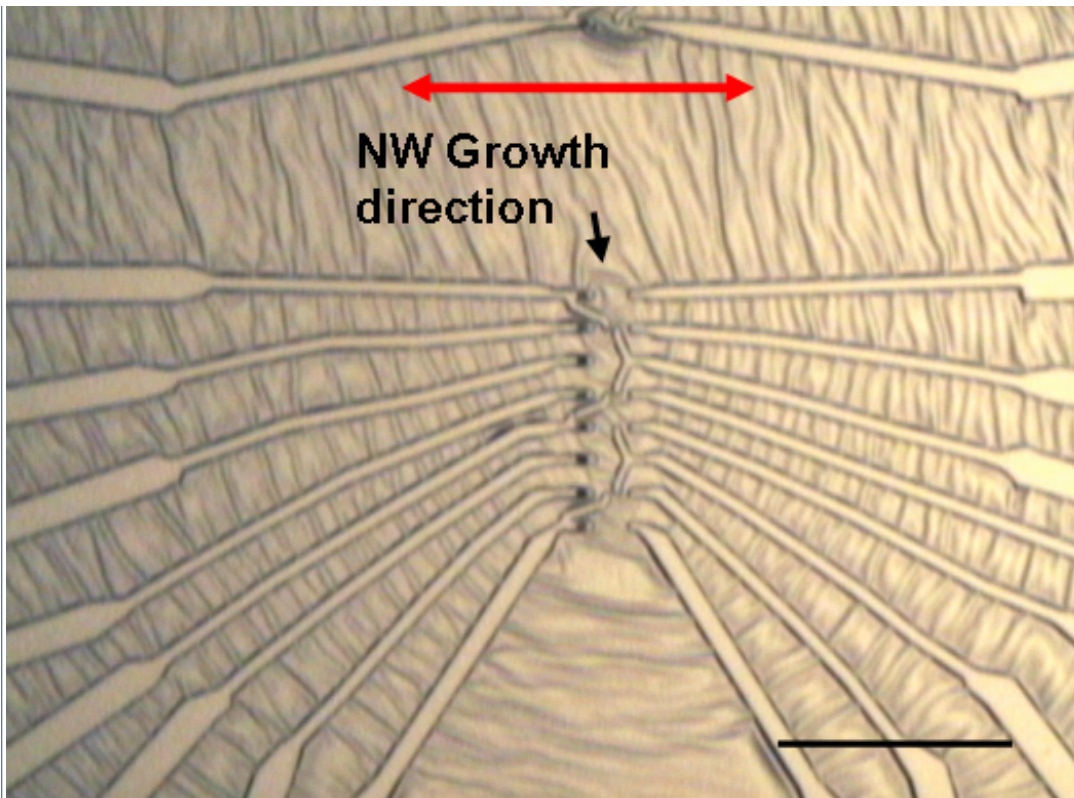
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Grow nanowire for semiconductor devices using this photolithography process. The nanowire is directly grown on the device substrate to which electronic components are subsequently added. The new process eliminates several fabrication steps, thereby enabling the microelectronic industries to fabricate nanodevices on an industrial scale.

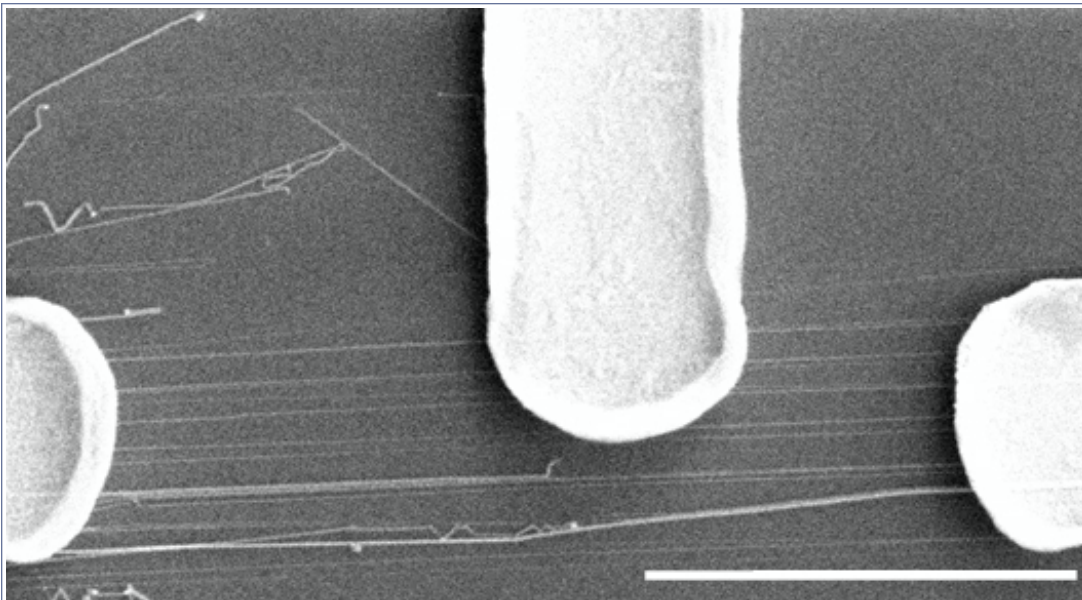
#### Images

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Metal electrodes on zinc oxide nanowires; dark central spots are the gold pads that start nanowire growth; red arrow shows direction of growth; scale bar is 50 micrometers.



Scanning electron microscope image shows electrodes connected to group of nanowires; Scale bar is five micrometers long

## Applications

- **Heterostructure semiconductor fabrication**  
Enables the construction of heterostructure semiconductors and their

nanodevices.

- **Mass fabrication**  
Permits mass fabrication of nanowire-based transistors and sensors including field effect transistors, flash memory devices, nanosensors, and nanolight emitters.
- **Nanocrystals**  
Potential use in the field of nanocrystal growth as a platform for building more complex architectures.

## Advantages

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- **Millions of configuration possibilities**  
Using this process, millions of nanowires with known registries and orientation can be grown.
- **Cost savings**  
Fabrication via low-resolution photolithography.
- **Produces a variety of configurations**  
The number of nanowires per site can be controlled, depending upon the number of gold nanodroplets per site; individual or groups of nanowires can be grown and assembled into nanowire devices.
- **On-site precision**  
Nanowires can be grown with a sub micrometer precision directly on the substrate to be used, eliminating the need to transfer the wires to a different substrate.
- **Easy to produce**  
Scalable process reduces the number of fabrication steps and provides easy device fabrication.

## Abstract

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This invention allows control over the location and direction of nanowires on a large size single crystal wafer.

## Inventors

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- Nikoobakht, Babak

## Citations

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1. B. Nikoobakht. Towards industrial scale fabrication of nanowire-based devices.

Chemistry of Materials, Vol. 19, pp. 5279-5284, 2007.

## Related Items

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- Article: Gold Nano Anchors Put Nanowires in Their Place
- Article: NIST Demos Industrial-Grade Nanowire Device Fabrication

## References

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- U.S. Patent Application # 20090124053
- Docket: 08-011

## Status of Availability

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This invention is available for licensing.

Last Modified: 03/11/2010